Electricity on the Farm

A MONTHLY MAGAZINE FOR THE UP-TO-DATE RURAL FAMILY

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WHAT IS YOUR TITLE FOR THIS PICTURE?
(See inside back cover for rules and cash prize contest.)

In This Issue

NOVEMBER 1937

FRESH AIR FLOWS AT FORTY-FIVE—PUSHING UP PROFITS WITH SOIL HEATING CABLE—A MIXER FOR COW KITCHENS—DOLLARS TO DUMKAS—ELECTRIC HOUSEKEEPING AND OTHER REGULAR FEATURES.

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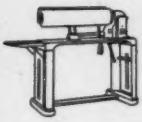

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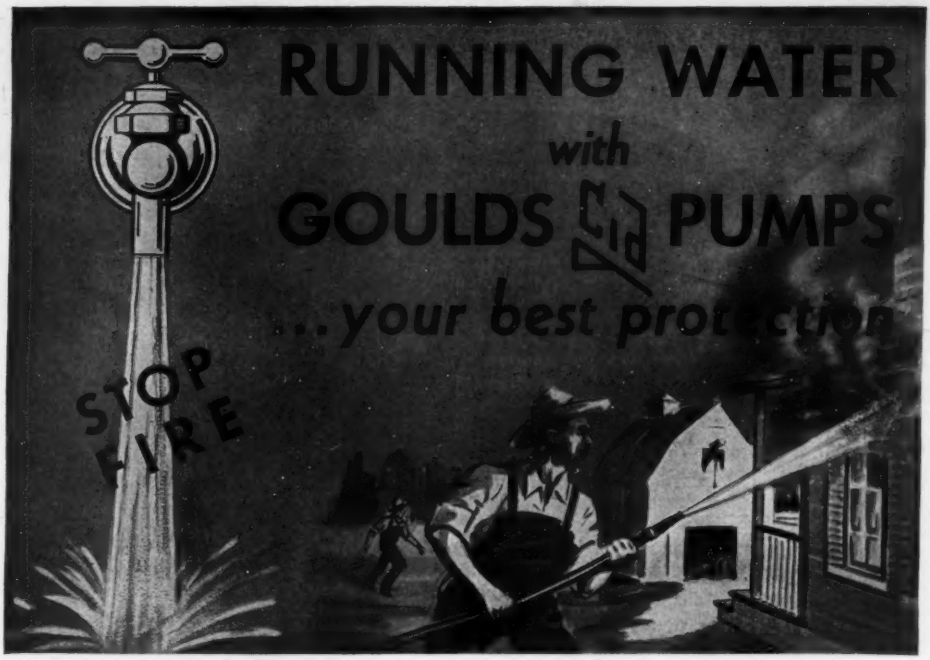

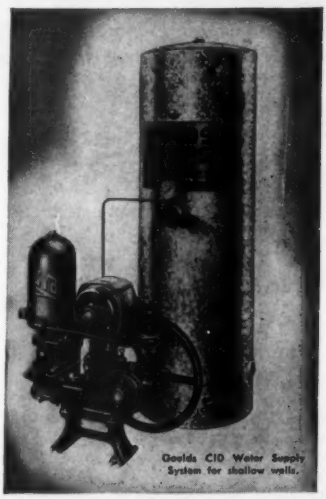
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Editor's Chat

GOOSEPIMPLES

"Editorial." This is our first personal encounter with that word from behind the pencil. It sounds a little chilly; sort of has a tendency to promote goosepimples on one's mind. ELECTRICITY ON THE FARM is a friendly magazine. We want it to be "homey." So we'll chat, and not "editorial."

CARDS ON THE TABLE

This morning I am in a building in the heart of New York City. I have literally been "electriced" into the office. My breakfast, my newspaper, the subway train, the traffic lights, the elevator, all had an electric push. Around me factory motors, store lights, doctor's X-rays, even the barber's clippers are "watting" along. There are no pole lines in the street, but the city is permeated and kept alive with electricity. It is everywhere. When I question why, there is one answer: "It pays."

At present the popular conception of *rural* electrification is the setting up of poles and the stringing of wires. That is not electrification. It is just the building of the trail that makes rural electrification possible. Until we learn to use electricity constructively and profitably on the farm, we have no real electrification.

The business man, the factory manager, the city home owner is not interested in power lines. He assumes them. He may not even know they exist. What he is concerned with is how he can *use* electricity to improve his products, save expense, live better and get more of my dollars.

Electricity itself is valueless. It becomes valuable only when used in relation to health and living, to eliminate drudgery, to grow more or better products or to add to their value by processing. It must be one of the factors in home management and in farm management.

There are economic problems to be solved. Electricity should not always come first. There may be school books to buy or dental work to be done. Eventually, the intelligent use of electricity will help to pay those bills.

Perhaps we need bolder conceptions. The experimenter or the pioneer who does the "impossible" today may be setting the average pace for tomorrow. What John and Mary are doing with electricity at Five Oaks farm may give us a tip for Three Oaks.

The real problem is to continue to learn how to make electricity work for us economically and profitably. No sleight of hand; just keeping our heads in the air, eyes open and feet on the ground. This is our attitude toward electricity. Our cards are on the table.

GEORGE W. KABLE.

THANKSGIVING

So once in every year we throng
Upon a day apart,
To praise the Lord with feast and song
In thankfulness of heart.

ARTHUR GUITERMAN, The First Thanksgiving.

November, 1937 ELECTRICITY ON THE FARM Vol. 10, No. 11

Issued Monthly by
CASE-SHEPPERD-MANN PUBLISHING CORP.
Editorial-Executive Offices: 24 West 40th Street, New York

GEORGE W. KABLE, *Editor*

KARL M. MANN, *President* FRED SHEPPERD, *Editorial Director* I. H. CASE, *Vice-Pres. and Gen'l Mgr.*
K. H. GORHAM, *Advertising Manager* JESSE H. NEAL, *Vice-President*

CHICAGO: 6 No. Michigan Ave.—W. S. CLEVENGER, Western Manager; L. M. ROCHE, Western Representative
SAN FRANCISCO: 444 Market St., Room 305—C. H. WOOLLEY

Subscription price, 75 cents per year; single copies, 10 cents; Special Bulk Rates on Application
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Christmas

Comes 365 days a year when you give electrical gifts

Christmas joy will be renewed a thousand times in years to come if you give electrical gifts, thoughtfully selected to fit the needs of each member of the family.

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Getting ready for spring. Cables in hotbed on farm of W. S. Wagner, Williamsville, N. Y., ready for top soil.

PUSHING UP PROFITS with SOIL HEATING CABLE

By EARL BURKE

A PROFIT of $46.90 before the crop was even started, followed by a record-breaking bumper yield of tomatoes was the pleasing experience last season of Walter H. Brown, farmer in the Natomas district, California. This was the result of applying electricity to germinate the seeds and develop sturdy young plants. Sounds almost like a fairy tale, but it isn't.

The Brown tract of 100 acres in the Sacramento Valley is good level land, no rocks. Here Brown specializes in raising tomatoes. Approximately 165,000 young plants are required to plant his field crop.

His big difficulty last spring was to raise that many healthy young plants and have them ready at one time for field planting. Raising 165,000 tomato plants is quite a large order, and to have them grown in time by old-fashioned methods presented a real problem.

Just about the time Brown got his seed ready for planting, an agricultural power salesman for the Pacific Gas & Electric Company visited the farm and suggested that an electrically heated bed would solve his planting problem. The representative explained that a much greater germination of seeds would undoubtedly result and young plants would be ready earlier for field planting. This suggestion seemed like the answer to Brown's production trouble, so he agreed to try it out. The power man recommended laying out a hotbed 60 feet long to raise the requisite number of young plants. But Brown was a bit skeptical about the promises of almost complete germination of seeds and insisted upon a bed at least half again as large. He wanted to be absolutely sure about raising enough plants for his requirements and felt that a bed 96 feet long would be just about right. The seed bed was prepared accordingly and wired for electric heat.

The heating installation consisted of flexible lead covered cable which led back and forth along the bed, spaced at regular distances, until the ends of the cable were connected at a thermostat on the edge of the plot. The thermostat regulated the temperature. The cable runs were spaced about six or seven inches apart, with a little closer spacing at the outer edges to provide more uniform heating throughout. The cable was then covered with several inches of good top soil.

The seeds were planted February 12. Brown felt he would also like to have a check on the performance of the electricity-heated bed as compared with natural germination and growth, so seeds were sowed at the same time in a richly-

fertilized plot which had no heating. Then he closed the switch and waited to see what would happen.

Five days later the seeds in the electrical bed had not only sprouted but were coming up. A thick uniform growth of green could be seen all over the entire surface of the bed. Over in the check plot nothing could yet be seen; in fact, the seeds planted there didn't make an appearance until many days afterwards.

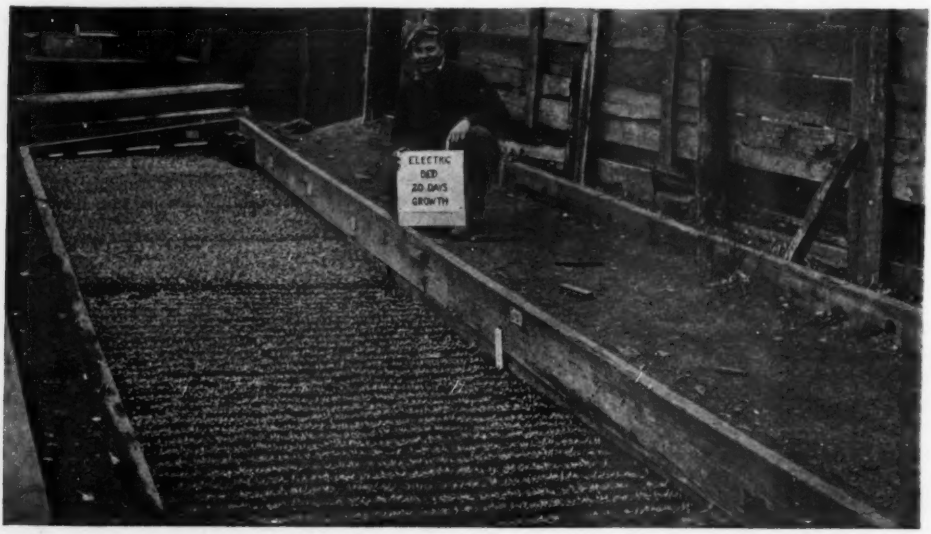
It was clearly evident from the growing green carpet that hotbed germination of seeds had been practically 100 percent, whereas in the unheated check plot, as it later developed, only from 30 percent to 40 percent of the seeds sprouted and came up.

There were also other differences. The plants grown in the electric hotbed had much larger roots and were stronger and healthier than those grown in the old-fashioned way. Besides this early start, the electric heated plants when set out in the fields grew faster and larger than those from the check plot.

Above: At right, 30-day-old cabbage plants in electrically heated bed. At left, 41-day-old plants—same seed—in manure heated bed. Farm of C. Glorioso, New Castle, Pa.

Below: 20-day-old tomato plants in electrically heated bed of C. Glorioso, New Castle, Pa. Note the good windbreak on two sides.

The cost of making the hotbed was $62, and the operating expense—the electric current for growing the plants—was $21.60, a total cost of $83.60. Then Brown had another pleasing surprise. The high percentage of germination of seeds planted in the hotbed not only produced the required number of 165,000 plants but there was a surplus of 29,000 left over. There being a demand for strong early tomato plants, he was able



to sell the extra plants for $135.00, which gave him an immediate profit of $46.90 before his tomatoes had even been planted in the fields.

When his tomato crop was gathered last fall it brought increased returns because it was larger and finer than any he had ever raised before. The phenomenal returns from the tremendous crop attracted attention, and people came from all over the district to see the harvest and find out how it was done.

Now other truck gardeners in the Sacramento region are finding it advantageous to follow Brown's example. The Japanese growers who specialize in raising tomatoes are also applying soil heating cable to their seed germinating plots. Twenty-three such beds have been installed since the first of this year, covering 2,290 square feet and using 3,900 feet of heating cable.

These soil heating installations give young plants a much earlier start in the spring because it is no longer necessary to wait until all frost dangers are past before planting the seeds. With soil heating equipment, seeds can be planted much earlier than before and young plants can be grown and ready for transplanting to the fields about the time frost dangers are over. There is, of course, no advantage in placing young plants in the fields as long as frosts are likely to occur, but they can be grown in hotbeds without frost dangers and thus be ready to produce a much earlier crop than the old way.

Some growers also use electric soil heating equipment to raise plants in pots instead of planting the seeds or cuttings directly in the soil over the heating cable. This arrangement is sometimes necessary where plants must be handled or moved around. Where pots are preferred, a layer of sand instead of soil is placed over the heating cable, and the pots rest directly on the sand. The heat rises through the sand and gives the soil in the pots the required temperature for germination and growth.

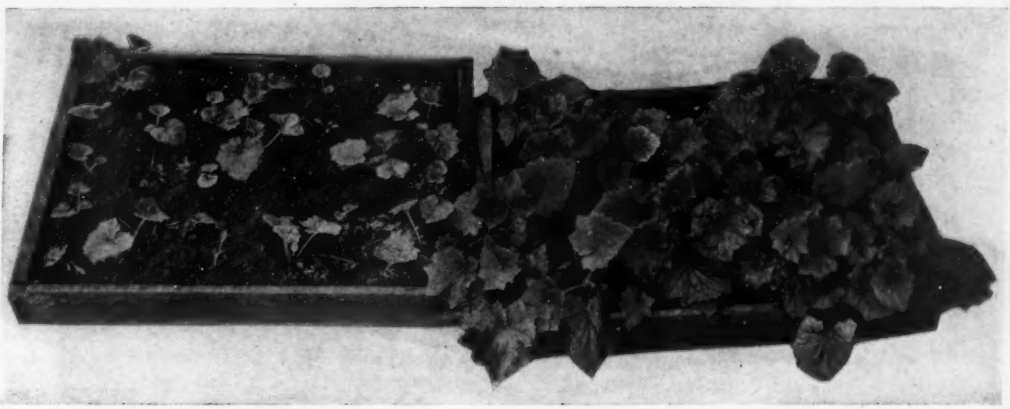
Successful users of this kind of heating installation are Avensino and Mortensen, who operate a large greenhouse opposite the Tanforan race track near San Francisco. Here 1,600 feet of soil heating cable is used to root carnation cuttings. The growers say they get 90 percent of the cuttings to root where soil heating cable is used, as compared with only 40 percent to 50 percent where it is not applied.

Raising young plants in large quantites from seed is no longer full of uncertainties. Electric soil heating takes out much of the guesswork.

* * *

Editor's Note: California has no corner on soil heating profits. Isaac Santon got excellent results on a variety of plants in snowy Indiana (see ELECTRICITY ON THE FARM for March, 1937).

Uncle Sam thought it was good enough for him to install four very large beds in Washington (see E.O.F. January, 1936). And George Reitz told in the November, 1935, issue of a lot of farmers in Canada, Montana, Missouri, Ohio, Oregon and New York, who were finding electric soil heating good business.



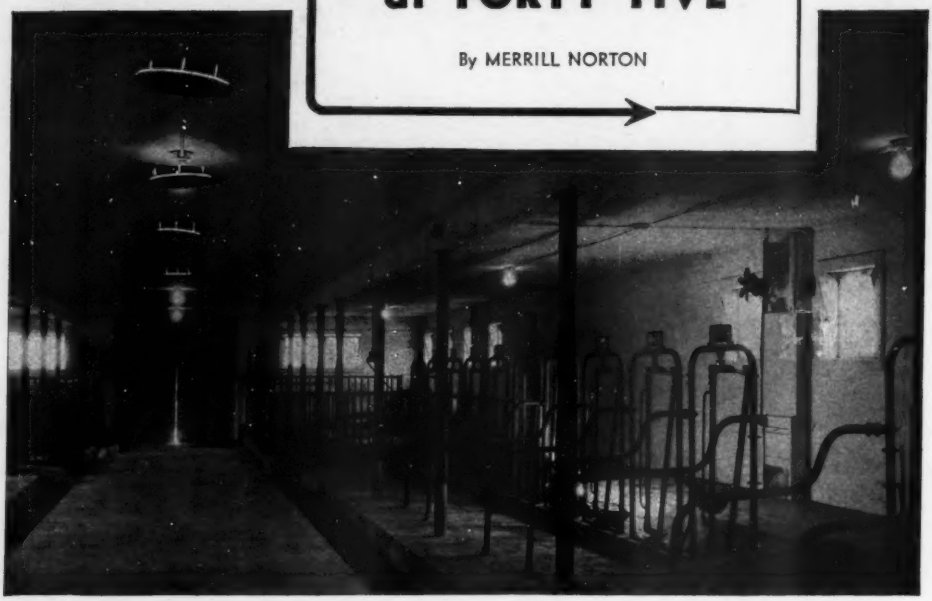
California seed germination test beds. Unheated bed at left; electrically heated at right.

Now is the time to plan for spring hotbeds. Heating cables and thermostats must be ordered. Very few local stores carry them. Plan your seeding so that the plants will not come on too early. Plants grow faster in electrically heated beds.

Electric hotbeds are easy to build. In their simplest form you merely substitute soil heating cable for manure, placing five or six inches of soil over the cable. There are many little refinements which will give you better results or save on current consumption. The heating cable may be placed on the surface of the soil, or at a depth of four or six inches in the soil. Each placing has some advantages for certain crops and conditions. Good wind breaks and close fitting sash with well banked beds are important if you wish to save on current. Mr. Hienton told of some of these differences in his article in E.O.F. in January 1935. Agricultural Engineering Departments of State colleges, or local utility representatives can frequently give information on electric hotbeds applying to local conditions.

FRESH AIR FLOWS at FORTY FIVE

By MERRILL NORTON



Intake deflectors over ceiling outlets give good air diffusion. Exhaust flue and fan at right on side wall. Fan reversed for summer cooling.

"CONFIDENTIALLY, is electric ventilation for dairy barn really worth while?" asked one of my salesman friends. "It looks good on paper, but I am sort of skeptical about how well it works out in practice."

"Why don't you find out for yourself?" was his "come-back." "As you travel around Wisconsin, why not visit some of the farms that use electric ventilating systems and get the answers from the users themselves?"

I did it—and here are the comments of three or four typical users among the dozen I visited and some of our conclusions.

You can ventilate your barn with an electric fan system easily, efficiently, and completely at about one-half the cost of other ventilating methods. As compared with no ventilation at all the advantages are worth much more than the cost of the system.

The first thing, every owner of electric ventilating equipment said to me was, "it keeps my barn dry." Without any question the joists and timbers last longer when they are dry. Steel stall and stanchions do not rust so quickly nor so much. The growth of molds and bacteria is retarded. The drier air *seems* warmer.

What would you think if you entered your neighbor's barn some winter morning and saw his hired man take ten full pails of water and throw them about over the walls, ceiling and stanchions? You probably would ask the town examiner to look into his case the same as I would, but "strange as it seems" the 20 cows in his barn give off at least that much water every twenty-four hours. Where does all that moisture go? Your own barn perhaps gave you the answer during the cold weather last winter when the frost gathered on the walls and the moisture gathered in droplets on the ceiling. An electric fan, or two, or three, of the proper style, size, and speed, together with air intakes properly arranged, will remove this moisture and provide a dependable insurance policy on the life of the building.

Let me tell you of the experience of Charles Kieffer and his son, George, who run a large farm north of Auburndale in central Wisconsin, where the mercury in winter often takes a dive for the bottom of the thermometer and tries to hide there. They have a large barn, 160 feet long, which holds about fifty cows and a proportionate number of calves and young stock. George Kieffer said, "We couldn't get along without our electric ventilating system. It keeps our barn much drier than before and prevents the joists from rotting. It keeps the moist air from going up through the hay loft and collecting in the form of frost above the hay like it used to and then melting and dropping on the hay, making it spoil. It also prevents the rotting of the hay rope which we like to

leave in place. Since the air is drier it seems warmer."

Ignatz Yankowich, at VanDyne, Wisconsin, had a similar experience. When he built his fine new barn five years ago he had the stable ceiled and varnished. "Look at that," he said to me, pointing with pride to the ceiling. "Just like new and all we do is wash it once a year. I give our electric ventilating system credit for keeping it looking new like that."

The next most important advantage in the opinion of the users of electric systems on whom I called was a combination of keeping the air clean and fresh, the milk more free from odors and flavors, the cows more healthy, and the barn more comfortable. This might better be called a four-fold advantage, but all its parts are concerned with *fresh* air. We don't have to call in a staff of experts to tell us whether the air in our barns is fresh or not, because we were all born with one of the best fresh air indicators yet invented—our noses. When we step into a barn and the air smells stagnant, damp, and full of stale barn odors, ventilation is badly needed. An electric ventilating system will clean out this foul, damp air in a hurry, even though the air is foggy and quiet outside.

Did you ever let your mind wander during a dull

Exhaust flue and fan, H. C. Freeman barn. Note slide doors top and bottom—adjustable so either warm or cool air may be exhausted.

spot in the preacher's sermon and ask yourself why the ceiling of your church auditorium was so high? The main reason is to allow plenty of air for the people who might fill it up. Nobody has yet reported on how much more quickly some of us would fall asleep in church if the ceilings were as low as in most stables. When you think of the

Fan housing and adjustable openings. Flue intakes in background.

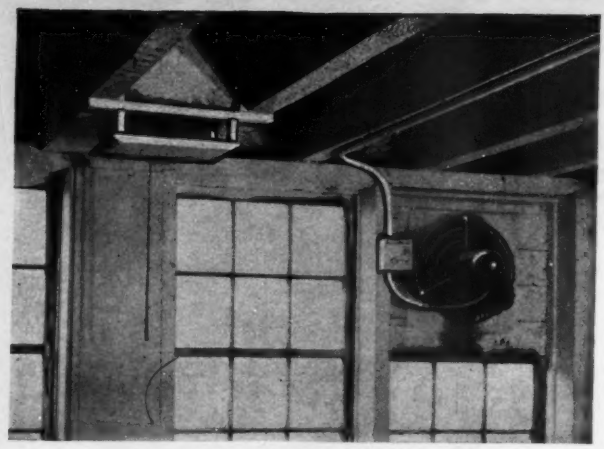
quantity of air that a cow requires, the need for proper ventilation is obvious.

George Kieffer said, "neighbors that come into our barn after being in some of the others around here always notice how clean and fresh the air is. I think it keeps our cows healthier."

Anton Jagow, a farmer living near Mayville in eastern Wisconsin, has had his electric ventilating system in use for six years. He told me, "I think our milk has had a lot better quality since we've had ventilation to keep the odors out of our barn."

An answer to question of how much ventilation is worth in cash came from George Sowatzke, manager of the H. C. Freeman farm at Beloit in southern Wisconsin. "When we moved into the new electric ventilated barn our milk production came up about one hundred pounds a day with the same seventeen cows and the same feed and handling." If you will apply that proportionate increase to your own herd and figure it out in dollars, the profit you might make might startle you.

Nearly every dairyman using electric ventilation praised the uniform temperature in his barn. This, and the freedom from drafts caused by open windows, hay chutes, and other unreliable means of ventilation, seemed to help keep the cows healthier and the men working in the barn more comfortable. George Sowatzke, quoted above, said, "one thing I like best about our electric ventilating system is that in the winter time the barn is always the same temperature." George incidentally, uses his system in reverse in the summertime to cool the



Fan placed in window opening of bank barn on farm of Anton Jagow. Intake deflector at left between joists.

barn. "We close the barn doors while we are milking and it is a lot cooler and more comfortable with the fans running."

George Kieffer put it this way, "There isn't the draft that there is with chutes."

Anton Jagow was pleased because, "it works when the air outside is quiet or foggy, while the gravity system will let the water run down the walls."

The reason for all this uniformity of temperature lies in the thermostat which, like the control in a brooder, shuts off the fans when the temperature of the barn drops below a given point which is usually 45 degrees.

In its simplest form an electric ventilating system consists of one or more exhaust fans set in the wall of the stable along with some kind of air intakes and a thermostat to start and stop the fans. One large fan and intake would do the trick were it not for the undesirable drafts that would be created. If you are thinking about an installation it is a good plan to ask the rural service representative of your local utility to put you in touch with some reliable manufacturer of dairy barn equipment which will make suggestions and plans to fit your own stable.

In order to prevent drafts you will need a number of air intakes. They are usually spaced twelve feet apart. Be sure to have one in each corner. It is usually best to box up the space between two joists and lead the air into the center over the cleaning alley, placing diffusing plates over the openings (see view of interior of Freeman barn). It is important to line the bottom of the flue formed between joists with insulating board to prevent condensation on the ceiling caused by incoming cold air. The best type of intake is one which works automatically to keep the same amount of air coming into the barn no matter how hard the winter winds blow. Plain registers or louvres won't do.

There are several good types of exhaust fans. They should be mounted with louvres of some kind to drop shut when the fans stop running to keep the cold wind from blowing in. Hoods should be placed on the outside over the fan openings for additional protection against the wind and weather. Care should be used in mounting each fan solidly and in such a way that it won't cause vibration and noise while it is running. If the side wall of the stable is made of stone, a part of a window opening may be used for a fan as in Anton Jagow's barn (see illustration).

The best practice seems to favor a flue built around each fan and extending to the floor of the stable so that the colder air near the floor level may be removed instead of the warmer air near the ceiling. Fifty percent more ventilation may be obtained in this manner according to U. S. D. A. Bulletin No. 187. The view of the Freeman barn shows a home-made out-take flue with adjustable doors both top and bottom. With this good arrangement all or part of the air can be exhausted from the ceiling level if quick cooling is desired.

Warm Barn Necessary

A warm barn is absolutely necessary. The Institute of Animal Nutrition of Pennsylvania found some years ago that for every degree below the point at which a cow begins to feel cold, the feed cost of maintenance increases 1.4 percent. In order to save feed and the work, and attention necessary to keep the temperature at the suggested forty-five degrees, it is best to install a simple thermostat with each fan so that it will stop automatically when the temperature drops too low.

A poorly built, drafty stable won't show good results with a ventilating system. The fans will not work long enough to take out the foul air. In regions lying north of the Ohio river or in equivalent temperature zones, most of the stone and concrete and many of the tile walls should be sheathed, windows tightly fitted and headers inserted between the joists to keep the cold air from blowing in unless the ceiling is insulated. A foot of hay or straw on the mow floor will take the place of ceiling insulation. A warm barn will pay dividends in the form of larger milk or cream checks.

The cost of an electric ventilating system will vary greatly according to the conditions of each barn. Most systems when properly installed with ample capacity and proper controls will run between ten and twenty dollars per cow.

The cost of operation is small and will also vary according to the number and size of the fans and the rate for electric service. It will take about 2 kilowatt hours per month per cow. At three cents per kilowatt hour that would mean six cents per cow per month or $1.80 per month for a twenty-cow herd during the months they are in the barn.

The enthusiasm of users of electric ventilation in Wisconsin leaves no doubt that it pays extra dividends in dry barns, healthy cows, and bigger milk checks.

MIXER for HEN AND COW KITCHENS

By H. J. GALLAGHER

MIXING poultry rations and dairy feed with a power mixer instead of by hand may, in many cases, result in a saving of time, labor and a more uniform mix. There are good power mixers on the market, but it is not expensive or difficult to build a good mixer. Figure 1 illustrates a four-sided 2' x 2' x 5' box made of white pine, tongued and grooved material. The construction details are shown in Figure 2.

Before conducting the experimental work on the design and operation of the box, two objectives were established: First, that the mixer have a capacity to care for 2000 birds at one mix; second, that the power required would not exceed ½ H. P.

Two factors become readily apparent in tests on boxes of different widths. Regardless of shape or size of the mixer, good mixing could be secured only when the box was revolved at a slow rate of speed and when filled about one-third full. The width of the box had greater effect on power requirements than did length. As a result of several tests, a 24-inch width was decided upon as being most satisfactory for lengths up to 5 feet.

A box 2' x 2' x 5' has a good mixing characteristic to 250 pounds. As the amount of feed exceeds 250 pounds, the efficiency of the mixer rapidly decreases until it is readily apparent that all mixing action would cease when the box was filled. If the box is too long for some of the smaller mixing rooms, the length could be readily changed. A 2' x 2' x 2½' box of the same type of construction as the larger box would have 125 pounds capacity per mix sufficient for 1000 birds.

Speed

In the rotary type of mixer the feed is elevated in an arc. As it goes upward, the force of gravity becomes effective, and the upper layers of feed break and slide over the lower layers. The more pronounced the action the better is the mix. If the rotation is too fast, centrifugal force delays the break in the upper layers of grain, and the mixing action is less effective. With a speed as high as 55 R. P. M. the mixing action is negligible, for at this speed, as the feed breaks, the top layers are thrown to the opposite side of the box without the rolling and sliding action that is essential. At higher speeds centrifugal force would keep the feed in its starting position without any mixing. The speed that was finally adopted as desirable was 14 R. P. M.

Operation

The first operating tests were conducted with-

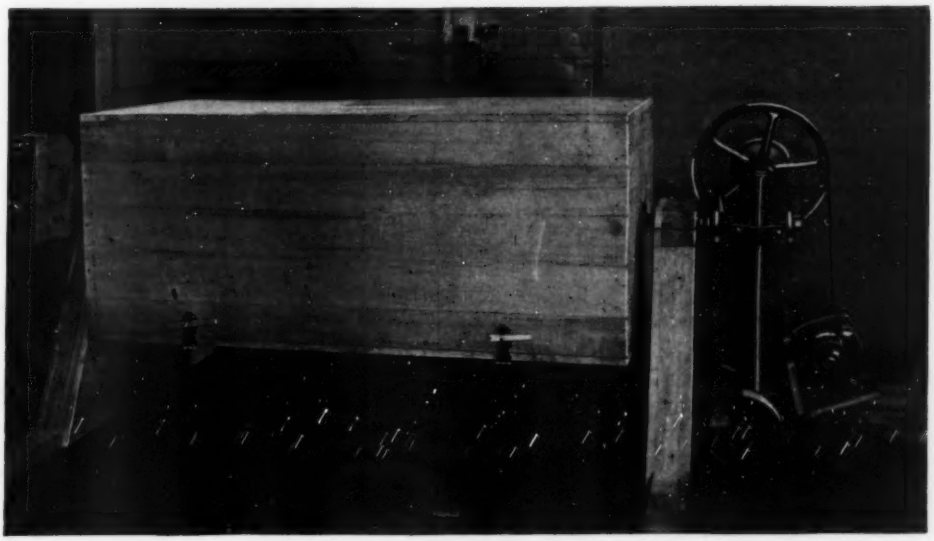


Fig. 1. A simple feed mixer. In this position, the feed is dumped on the floor when the box is opened.

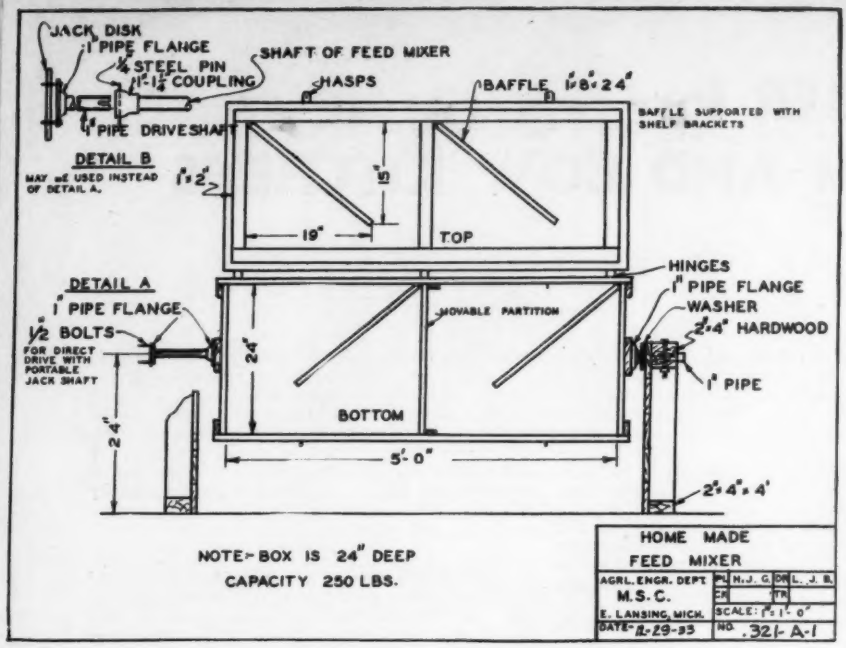


Fig. 2. Construction details. Mixer turned on its side with top raised to show interior arrangement of baffles and removable partition.

out baffles. Satisfactory results were obtained when the different ingredients used in the mix were evenly distributed in the box in successive layers. Results were unsatisfactory when the grain was not uniformly distributed in the box.

The best mixing results were obtained by installing baffles on the top and bottom of the mixer as illustrated in Figure 2. With this assembly the box can be loaded with no thought as to arrangement of feed. As the box begins rotation, the bottom swings upward. The baffles lift, and at the same time alternately slide a large percentage of the grain into one end of the box. The baffles on the opposite side of the box, when in lifting position, slide the feed to the other end. In one complete revolution the grain receives the rotary mixing action and in addition receives the mixing action involved in changing the feed end to end in the box. The baffles do not interfere with unloading the mixer, which can best be unloaded in positions shown in either Figure 1 or Figure 2.

In operation three complete revolutions gave a good mix. Fourteen revolutions (one minute) should answer practically all mixing requirements. The removable center partition, illustrated in Figure 2, may be used to advantage if it is desired to mix two different rations at one time or if only one-half batch is mixed. The partition has the additional advantage of making the baffle action more effective by reducing the distance in sliding the feed from end to end of the container.

To obtain a speed reduction from 1725 R. P. M. at the motor to 14 R. P. M. at the mixer, an ordinary back geared worm drive pump jack, ratio 16-1, was equipped with a 15-inch pulley and driven from a two-inch V-pulley and ½ H. P. motor. The speed reduction unit was mounted on a truck, Figure 1. A line shaft with the necessary pulley combinations was considered too complicated and expensive. As an illustration of the problem in speed reduction, a 2-inch diameter pulley on the motor would require a pulley of 246½ inches or 20½ feet diameter pulley on the mixer and a belt over 60 feet long to give the required speed of 14 R. P. M.

The mixer may be connected to the speed reduction unit as shown in Figure 1. The method of making the connection is illustrated in Figure 2, detail A. In case a direct drive shaft is desired, a 1-inch by 1¼-inch reducing coupling can be threaded on the end of the mixer shaft instead of the pipe flange, and the drive shaft used as illustrated in Figure 2, detail B.

The mixer when connected to the speed unit can be held from rotating in any position desired when the electric circuit to the motor is open. The box loaded with grain has not enough weight to turn against the worm drive of the pump jack. This simplifies the loading and unloading of the mixer.

The mixer may also be used to mix fertilizers or different ingredients of dust sprays.

Cost

The approximate cost of materials for building the mixer is $8.00 to $10.00. The box may be made of 1x6 inch pine flooring. Hinges and hasps should be strong enough to stand the pounding of the tumbling feed. Baffles may be held in place with strong, steel shelf brackets. A metal binding strip 1 inch wide around each end will strengthen the box.

For anyone who wants a more rugged mixer or does not care to build his own, there are several good ones now on the market.—Editor.

LADDERS are the only approaches to some Norwegian farms, which are mere ledges on the mountains. The farmers used to pull up the ladders when the tax collectors came around, but now the law requires a stationary ladder.

—*Voyager.*

DOLLARS TO DUMKAS

By H. C. FULLER

THE Dumka Poultry Farm at Whitesboro, N. Y., is a real family enterprise. Mr. and Mrs. George T. Dumka and the children, Phil, Bud, Bob, Dorothy and Jean, all have their part in the business and have contributed to its unusual success. The laying flock is not large, only about 1,000 birds, but the Dumkas have many other activities which require skill and good management. They raise high quality White Rocks exclusively. Thousands of baby chicks are sold each year, and dressed poultry, fancy eggs, and breeding stock are also products of this farm.

Constant trap nesting and careful breeding have produced a very fine strain which has stood the test in many contests. The Dumka pen entered in the official egg laying contest at Horseheads, N. Y., was the highest White Rock pen in the United States at the time of our visit. The Dumka boys have a pen in the 4-H Club contest which has been leading all breeds in New York State.

"With the great amount of detail work in which the whole family takes part, electric labor saving devices are an absolute necessity," says Mr. Dumka. "Electricity has contributed very much to our success."

Electrical Equipment on the Dumka Farm

A walk about the farm will convince anyone that the Dumkas believe in electrical equipment. There is a new electric incubator of 20,000 eggs capacity. They have nine electric hovers and one electric battery brooder. "Electric brooders are a large factor in getting utmost vitality in our birds," according to Mr. Dumka.

An electrical walk-in cooler helps to keep meat and eggs at top quality. Electric candling devices, heaters, cleaners, etc., are used throughout.

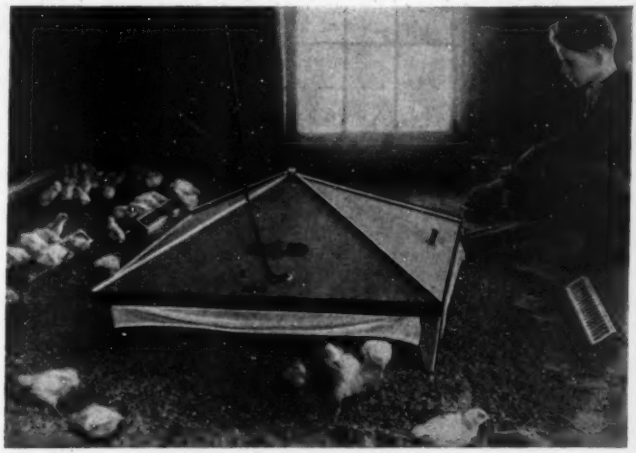
The house has also been equipped with the best labor saving equipment. There is a washer, cleaner, water pump, range and water heater which give Mother and the girls additional time to help with the business. Last year this farm used 10,176 kilowatt hours. "Check meters put on some of the heavier equipment show the cost to be comparatively low," says Mr. Dumka.

"We look at our electrical equipment the same as at our birds—they must be profitable or we will not have them. All of the electrical equipment we have has paid its way."

I'm proud I am a farmer.

Upper: Electrical equipment helps to keep the Dumka boys interested in the farm. They are 4-H Club members and have their own part in the business.

Lower: Electric incubators and battery brooders have aided in the winning of achievement cups on the Dumka farm.



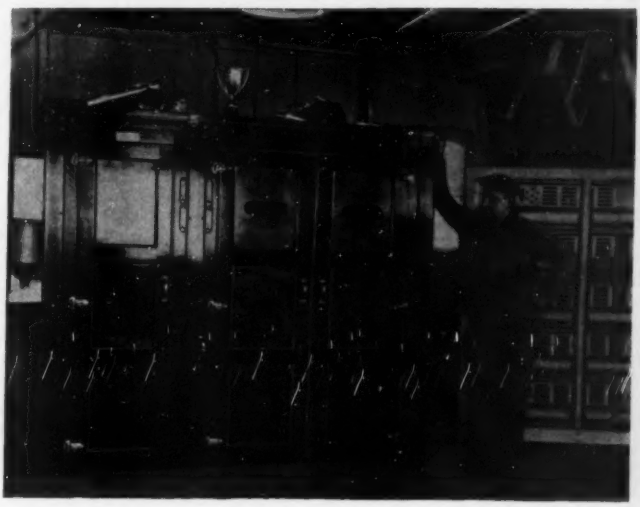


Fig. 2. Gumming a crosscut saw.

HOW TO FIT the CROSSCUT SAW

By L. M. ROEHL

THE points of the cutting teeth of a crosscut saw are two rows of knives that make two cuts across the timber. The rakers or drag teeth are shaped like wood chisels and drag or rake the wood out between the two cuts made by the cutting teeth.

In fitting a crosscut saw the first thing to do is clean it with pumice stone and water as is done with hand saws. As a usual thing the second step necessary is to gum it. This means that the metal between teeth and rakers needs to be ground out. It is done with a motor-driven grinder. Instead of the grinding wheel, a thin, round-edge wheel called the saw gummer is used. Gummers are made to a variety of thicknesses and diameters, and it is desirable to have a ¼" x 6", and a 3/16" x 8" for shops where a variety of saws are to be fitted. Many saws can best be fitted by use of the 3/16" gummer between teeth and rakers and the ¼" between points of cutting teeth. Both were used in fitting the saw Fig. 1.

Fig. 3. Filing the cutting teeth of a cutting saw.

The shape of a crosscut saw before and after gumming and filing is shown in Fig. 1. To make this drawing the blade of the saw was placed on the paper and the outline traced with a pencil.

Gumming the saw by filing the metal out is out of the question as it is far too slow and laborious and expensive in use of files. A high speed gummer running 2500 to 3000 RPM is needed. Slow speed tends to heat the saw blade excessively.

A support or tool rest needs to be provided that will hold the saw on a level with the center of the gummer. The saw is placed flat on the rest and pressed lightly against the gumming wheel. See Fig. 2. If much metal needs to be removed as in Fig. 1 it is good practice to do only part of the needed gumming at one place and then move on, thus allowing the saw blade to cool.

Emery wheels tend to become out of round and the surfaces tend to become coated with metal. An emery dresser is needed to true up the wheels and to clean the surfaces. A grinding wheel or saw gummer, the surface of which is coated with metal, does not cut well and heats the saw blade excessively.

How wide and deep to gum a saw depends on the saw at hand and the workman needs to use his judgment. It is good practice to make a pattern of a new saw of the same style by placing it on a paper and drawing the shape of the teeth and then try and keep it that shape in subsequent fitting.

After the saw has been gummed it is jointed. This consists of running the side of a mill file lengthwise of the blade until all teeth and rakers have been touched and thus brought to a line. For this work the file is held as in Fig. 3, or in a crosscut saw tool which holds the file at right angles to the side of the saw blade.

After the saw is jointed the rakers are lowered. This is done by filing the points off straight across the blade to more than 1/32" or less than 1/64". See Fig. 1. The crosscut saw tool may be used for this operation or it may be done without the tool if the filer's judgment of distance permits.

The rakers are then filed straight across by filing between points as indicated at C, Fig. 1.

A flat file is used to make a raker gullet of 90 degrees. It is good practice to fit every other raker from one side and the rest from the opposite side. The inaccuracy that occurs on one side will then be counterbalanced by a similar inaccuracy on the other. This will aid in making the saw run true.

After the rakers have been fitted, the teeth are filed. The file is held as shown in Fig. 3. Every other tooth is filed from one side and then the saw turned end for end and the others fitted in like manner from the other side. If the point of a tooth is off center it may be improved by filing only enough from the long side to give the side of the tooth its right shape and then do all the rest of the filing from the short side. The workman needs to be careful to stop filing when the tooth has been brought to a point. One stroke after that would bring the tooth down and out of service.

Crosscut saws may be set in either of two ways, the spring set or the hammer and anvil set. For those who do not fit saws extensively the spring set is likely to be more uniform since the tool is regulated and all teeth will be set alike. The hammer and anvil set requires that the points of all teeth be placed in identically the same position on the anvil and struck with the same weight of the hammer.

Each of the many makes of saw sets is provided with adjustments for regulating the depth of set and the amount. So regulate the set at hand that not over ¼" of the point is set or sprung over. A short abrupt set is preferable to a long one.

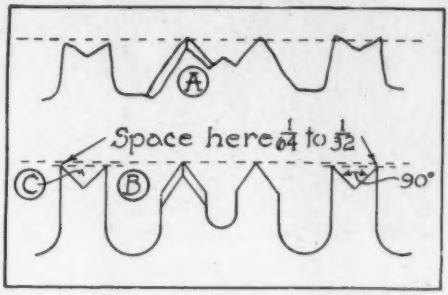


Fig. 1. (A) The actual shapes of the teeth before fitting. (B) The same saw after fitting.

Cleaning Eggs in Comfort

By J. C. SCOTT

Warmth provided by the electric heater adds comfort to Mrs. Ferris' egg room on cold days.

THE electrically driven egg cleaner is a real saver of time and labor.

While talking with Mr. and Mrs. F. T. Ferris, who live on a poultry farm near Chehalis, they commented on the egg cleaner as not only saving a tremendous amount of time and labor, but also enabling them to get a higher grade on their eggs.

Cut Cleaning Time in Half

"Before installing the egg cleaner," Mr. Ferris said, "it was necessary for us to spend every spare moment we had from chores, cleaning eggs. It is a job to grade and pack the eggs from a flock of 1200 pullets, at best. You know, that egg cleaner simply cuts down our work to a point where we have time to go to town once in a while, or spend the evening out, where it was formerly necessary for us to work until far into the night at times with these eggs during certain times of the season when they were especially dirty."

Mrs. Ferris was especially proud of her new egg room, which had been constructed in one corner of the shop. This was a small room, double wall construction, with sawdust for insulation in the walls and ceiling. In cold weather Mrs. Ferris can work with comfort with the electric heater which is turned on when needed.

Many poultrymen have found that the electric heater in the egg room not only makes it possible to work in more comfort but actually pays in the saving of eggs from breakage, that is, when one is working in a cold room, their fingers become numb and many eggs are broken as a result.

ELECTRICITY AT WORK

Top Row: (left to right) No more whiskers in the soup here; and no dirty hands in the kitchen sink at meal time. The old sink is in a small room adjoining the kitchen on a farm in Maryland. What woman wants the men-folks washing and shaving in the kitchen? This solves it.

Winter in the J. L. Aitcheson barnyard near Laurel, Md. No darkness here at chore time or when guests come. And such illumination at the snap of a switch should effectively discourage prowlers. A 200 watt lamp in shallow dome reflector on pole at left; a 100 watt lamp on barn at right.

A little motor for a big job. The motor is ¼ h.p., and the churn a 20 gal. barrel on the Biggers farm in Mississippi.

Center Row: (left and right) Zigzagging electric heating cables into a plant house on the Tom Wrates place at Sodus, N. Y. These

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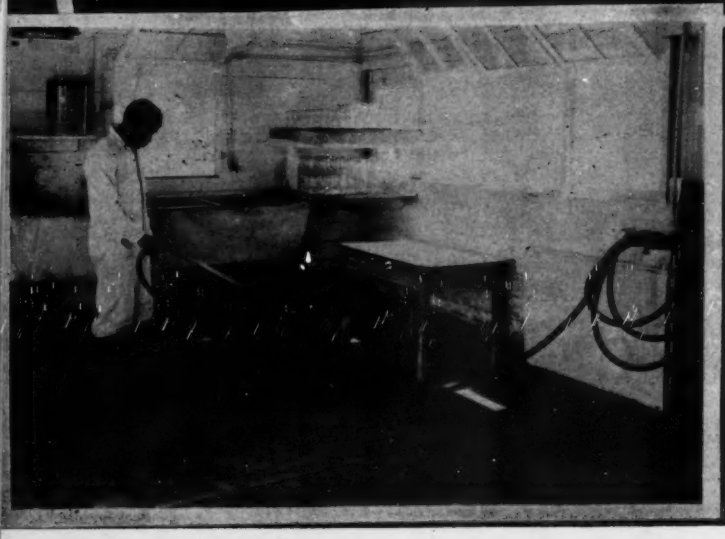


WORK ON THE FARM

houses are used for growing celery plants in the early spring. The houses are made of standard hotbed sash.

An electrically heated greenhouse bench on the farm of Mrs. J. F. Schult & Son, Hilton, N. Y. Control switch and thermostat on wall at rear.

Lower Row: (left to right) Farm sanitation calls for an adequate supply of running water. This is the milk room on the dairy farm of Ray Biggers at Biggersville, Mississippi. Note the electric water heater just showing at the right.

This hatchery of Charles Hines, Olney, Maryland, started with one small electric incubator. Electricity has been a major factor in building up this business. Electric incubators and hatchers at left; battery brooders at right.

Candling eggs by the tray on the Hines farm in Maryland. Mr. Fenby is using a retractive lamp. It pulls down or rolls up like a window shade.

ELECTRICAL

HOUSEKEEPING

CONDUCTED BY

GAIL MEREDITH

HOME WORK

YOU meet them everywhere, groups of little children trudging home from school with books under their arms. As soon as supper is over and the dishes washed, they'll open those books and start in on their home work.

What kind of light do your children study by?

If a seven year old brings home a primer to practice up on "I see a cat," he hasn't a very difficult seeing problem. The letters are large; they are widely spaced, and look very black on the white paper. But the high school sister with a history book, English Comp, and a dictionary at her elbow, needs plenty of light to be able to see. As a matter of fact, both need enough so they can see easily and comfortably. And when I say plenty of light, I mean plenty by measure, not by guess.

For light is not a matter of guess work any more. You know yourself how fluctuating your own ideas of enough light is. It all depends on whether you go out into the dark from the light, or come into the light from the dark.

Measuring light is done with an instrument called a light meter. This measures the amount of light in a room, on a book, or on a study table, just as the thermometer measures the amount of heat in the room.

As a result of years of study and observation and research, lighting engineers have set up a table of lighting requirements for different work. They say that there should be from 20-50 foot-candles of light on the work your children do there in the dining room at night.

You can get that from a 100-watt bulb in a table lamp built according to the standard set up by the Illuminating Engineering Society, provided there is no more than 24 inches from the bulb to the children's work.

A lamp that bears the approval of this society, an IES lamp, for short, takes care of some of the other problems of lighting, too. For the amount of light is not the only thing to look out for in providing good lighting.

Glare is another. Light will glare in your eyes from a bulb that shows beneath a shade. You get it when a light shines on the glossy page of a book, or strikes the glass over a picture at just the right angle. Covering the bulb and changing the position of the lamp will cut off the unpleasant glaring light.

Even though it does not strike you in the face, bright patches of light with harsh shadows hard by, are not pleasant to live with. The quality of light is important, too. It must please the eye.

The IES lamp has a glass bowl enclosing the bulb. This diffuses the light, softens it, and makes it a pleasant light to see by. The white, or almost white lining of the shade, reflects the light making more of it available on the children's work. There are no harsh shadows where the light is diffused through glass. And the harshness of reflected light is cut down to a great extent.

Another rule of good lighting demands that there should be no sharp contrasts of light and dark in the room.

Stand in the kitchen door and look over at the children studying.

History with the aid of a good light.

Did they turn off the light in the ceiling fixture when they plugged in the study lamp? Is there a little pool of light on their work at the table, with the rest of the room, half-lit and shadowy crowding in around?

If there is, your child's eyes are called on to make a complicated and tiring eye adjustment every time he looks up from his book.

For good lighting, says the engineer, the foot-candle reading throughout the room should be at least one-tenth of that under the light provided for some special task. One-tenth that of the one providing the most light, I may say.

If your dining room has dark walls and ceiling, it will take more lamps to give you the light you need. Dark walls absorb light, you know.

Those children bent over their books need plenty of light, not only so they can see easily, but accurately, and quickly, and without fatigue. That is what the engineers say.

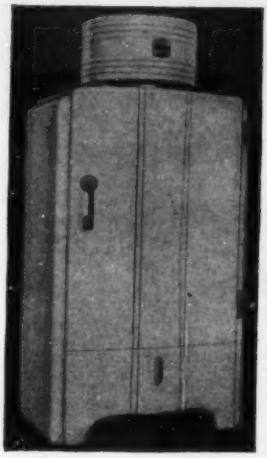
"According to the quantity and quality of light under which work is done," says Mr. L. C. Porter, lighting engineer, "there have been found definite changes in the ability of the human being to distinguish detail, differences in the speed with which eye work can be done, and in the amount of energy consumed to do the work.

"That seeing is actually a complex process involving not only the eyes themselves, but light, nerves, muscles, mind and even the heart, has been irrefutably proved by the results of thousands of scientific tests. Prolonged visual work in poor light may be as tiresome as doing a hard day's work. A person reading a book develops a third less nervous muscular tension with a prescribed, goodly amount of light than with a very meager amount."

I think that I shall never see
A billboard lovely as a tree.
Perhaps, unless the billboards fall,
I'll never see a tree at all.

—Ogden Nash

Meals Ahead!



Cook Them As You Go

I HAVEN'T seen one lately, but we used to see them often enough as we drove in the east or followed the mountains south to the Smokies. "Pictures Ahead!" the sign would read. Then further on, "Kodak as you go."

There are no painted reminders on our kitchen walls but we don't need one to know that there are always "Meals Ahead" for every family. Nor any follow-up to tell us that we are going to have to cook as we go.

But it is not necessary to do all the cooking at meal-times. If you are a wise planner, your basement is filled with cans ready to open so you can get together a meal in short order. You can make your refrigerator help with this, too, if you'll take a half a day now and then to get food ready for several meals. It will keep perfectly in the safe, low temperature of your electric refrigerator, and you can get the meal on the table with less time and work.

Perhaps it has never occurred to you to cook more than enough potatoes for two meals at a

Adequate light near every place where someone sits to work or read. That is a primary rule for good lighting.

You can make soup for several meals in your well cooker.

MY BEST FROSTING

Prize Winning Letter for August

Fluffy Marshmallow Frosting

2 egg whites (beaten stiffly)
2 cups granulated sugar
½ cup water (hot)
¼ teaspoon cream of tartar
½ teaspoon extract (lemon, almond or vanilla)
10 marshmallows (cut in bits with scissors dipped in cold water)

Method: Put sugar, water and cream of tartar in sauce pan and place upon surface heating unit on "high." When boiling point is reached, remove spoon, and continue boiling on "medium" until the "soft-ball" stage is reached. Remove from unit and add gradually six tablespoons of the syrup to the stiffly beaten egg whites. Return remaining syrup to unit and boil until it spins a thread. (While boiling this syrup beat the egg white and syrup mixture in mixing bowl continually.) Add remaining syrup slowly to the egg white mixture and then add the ten marshmallows, and beat with mixer at a medium speed. When about cold, add flavoring and when slightly glazed, spread on cake. On cloudy days, when the icing appears to be "runny," add a few more marshmallows; and, when it appears "sugary," add a little warm water.

MRS. LETCHER ODELL.
Gilliam, Saline Co., Missouri

time. You might just as well, though. If you will wash enough to fill the well-cooker on your stove, you can add a cup of water to them and cook them in forty-five minutes or an hour. Leave the current on High until the steam pours out, then turn it to Low till the potatoes are done. Cool them and then slide them into the refrigerator in one of your wire baskets.

This saves a good deal of time peeling them, for the skins come off more quickly after they're

If you make a gelatine salad for tomorrow's dinner today, your refrigerator will keep it perfectly.

cooked. It saves food values to cook them with the skins on, and it saves a good part of the time and current for boiling potatoes every day.

Perhaps you think they will discolor standing. They won't though. Not if they are good sound potatoes.

That leads us at once to the white sauce that you want for creamed potatoes or potatoes au gratin. You can make that, too, in large quantities.

Photo Courtesy of Calumet Baking Powder Company, Inc.
Fresh cookies always ready to bake.

It will keep fresh for several days in a screw top jar. Then it will be ready for creamed salmon, or chipped beef, or the ground remains of Sunday's roast. It will even help with a creamed soup if you're wanting one in a hurry.

Speaking of soups reminds me that that is another way of saving time and pot watching. If you will make a big kettle of vegetable soup on Saturday, you can keep some to send with the children's lunches next week. You can have it for Sunday night supper—and if it lasts that long, you and the little children can have it for lunch Wednesday or Thursday when you are at home alone.

A good soup bone will last almost a week at our house. But we like soup—and we heat it up several times during the week. After it is once prepared, it provides a filling lunch with little more work than getting it out and heating it up.

You can make up several jars of salad dressing, too, a French dressing, a boiled dressing, and a mayonnaise. You can vary them to suit your salads by adding whipped cream, ketchup, chopped pickles or chives. These dressings keep, I started to say indefinitely, but probably no one wants to

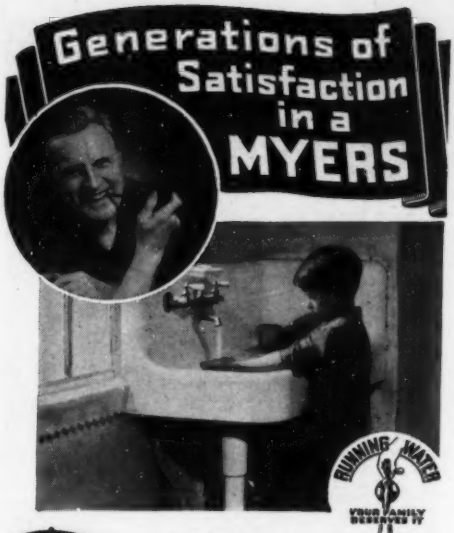
A good supply of rice will furnish a substitute for potatoes for one meal, fried patties for another, and a toothsome pudding for a third.

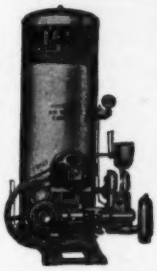
consider keeping her salad dressing indefinitely. I'll just say they are good to the last spoonful.

Jellied salads made today are good tomorrow, or the day after the day after that. A gelatine made with fruit, fresh or canned, is either dessert or salad, according to the way you serve it—but it is a dessert or salad ready before meal time. A gelatine salad is a good way to get the family to eat more vegetables—and it makes a good foundation for fish.

Many women who get into the spirit of this planning ahead make up a chocolate syrup or a butterscotch syrup to use on future puddings.

A cocoa syrup is made by cooking a cup of cocoa and a cup of sugar with a cup of water and a quarter of a teaspoon of salt very slowly until





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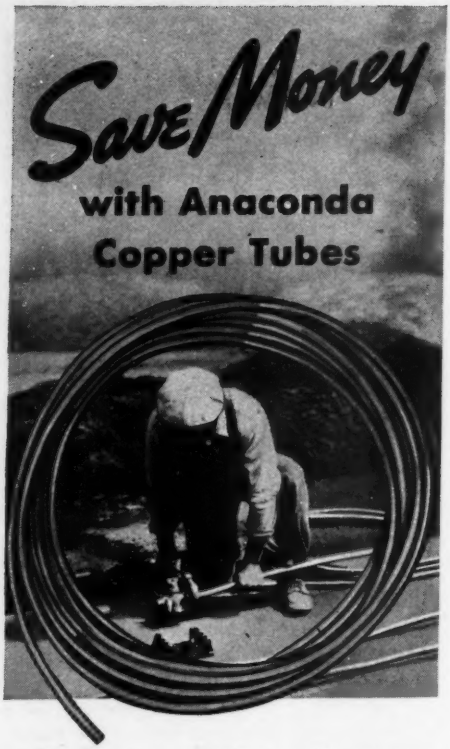


For your new Water System They Insure Rust-free Flow

Water companies use millions of feet of copper tubes for a good reason: they last many times longer underground than pipe that rusts. Yet they cost hardly any more. Also, copper tubes are:

- *thinner, lighter, need no threading*
- *less liable to burst if frozen*
- *readily bent, easily installed*

Underground, and in your house and outbuildings, Anaconda Copper Tubes will save you money by forever eliminating rust. Two types: soft for underground and interior plumbing. Hard for interior use only. 3779

Be sure to write for free booklet X-19

ANACONDA

Anaconda Copper Tubes

THE AMERICAN BRASS COMPANY

Gen. Offices: Waterbury, Conn. *Offices and agencies in principal cities*
In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

it is smooth. Stir it well, too, until all the lumps are out. Then boil it for a couple of minutes and add two teaspoons of vanilla. This makes a pint of syrup. You can take two tablespoons of it to a cup of milk and have your breakfast cocoa for the children or a cup for the thermos bottle in their lunch, ready in a fraction of the time it would take to get it all going in the morning.

Nor is that all. I hope your refrigerator is not full, for you do not want to overlook the fact that you can keep yeast dough for rolls in the refrigerator for several days. You can make up pastry ahead of time, and store it, without the addition of water, or all mixed, ready to roll out. Keep it covered in either case.

The left over batter from waffles or griddle cakes will keep for several days if you cover it up.

You can make a plain standard cake, divide it into two parts, and put them, covered, remember, into the refrigerator. One to bake this afternoon

November Contest

If I've gained ten pounds this month —which I won't admit I have, mind you, —but if I have gained those extra, unwelcome pounds, it is all your fault. I had to taste frostings as well as make them, didn't I, to find out which one to choose? And there were so many good ones that you'll all want to know about, that I'm going to give you a chance to later. Mrs. Odell's frosting is a good one to start on, isn't it?

This month seems to me a good time for your favorite recipes for hot breads, —muffins, biscuits, johnny cake. That favorite prized recipe all your friends borrow, and that you are so proud to share. If your Geat Aunt Lavina gave it to her daughter who tucked it into the family Bible and put it carefully away in the top drawer of that tall chest of drawers before it was loaded into the front of the Conestoga wagon, by all means tell us the tale. We'll enjoy the biscuits just that much more.

Five dollars, remember, if we print your letter. Or if it doesn't win the contest, and all of them can't, you know, no matter how good they are,—but we do use it in a story about hot breads, we will pay for it at regular space rates.

So all the letters become the property of the magazine, and in sending them to us, you agree to their use, or to the use of quotations from them in our editorial pages.

Send the letters to me, Gail Meredith, at 1026 Seminole Highway, Madison, Wisconsin.

just before supper. One to bake tomorrow or next day.

You can mix gingerbread ahead of time, too, and bake a small cake one day, and a few drop cakes the next.

There are several frostings you can make and store in your refrigerator ready to put on the cake when you want it.

Then, if you have a roll or two of cookie dough always on hand, you can have fresh cookies for breakfast or dinner, or baked while you make the tea, ready to serve hot to the minister when he brings his wife to call.

It is a great comfort to be ready for meals ahead of time.

• • •

Unless You've Made Other Arrangements

LAST winter, so a friend of mine tells me, one of New York's big stores ran an advertisement like this.

"Heating Pad—an ideal bedfellow. If you've made other arrangements, don't let us interfere."

Everybody laughed over it and joked about it, and thought about heating pads as never before.

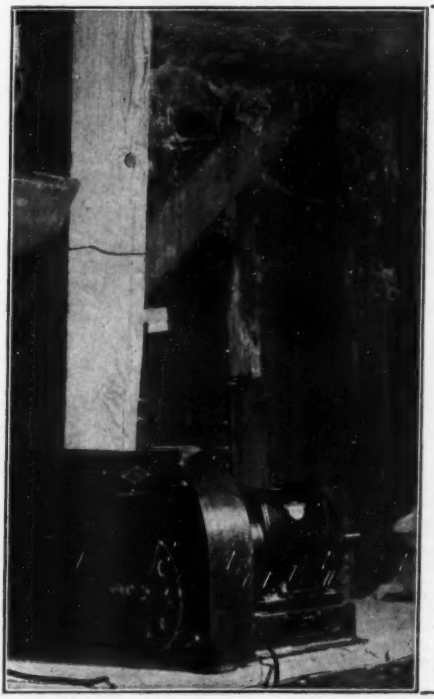
For they are ideal bedfellows. They take the chill off cold sheets and make the foot of the bed a warm welcoming spot when you first get in, not after you have laboriously, with your own body heat, warmed up the bed for sleeping comfort.

On less cold nights, when most of us would not think of needing extra heat, a heating pad brings comfort to a tiny baby or to old bones that shrink from cold.

A warm bedfellow.

Many people use them instead of a hot water bottle when they want local heat to combat pain.

The newest development in heating pads is an electric comforter made of two thicknesses of light weight material, enclosing a zigzag mesh of insulated, waterproof wire. The wires come out of a control box that you can put at the head of your bed. This box has in it both a thermostat for



Farmer Says His Viking Mill Saves Both Time and Money

John R. Liedel, 11141 Gramlich Road, Maybee, Michigan, has this to say about his Viking Hammer Mill:

Last spring I bought a small electric feed grinder (VIKING) and I find that it saves both time and money. For $4.50 to $5.00 a month I can grind feed for 17 head of cattle, 500 to 600 chickens and a few hogs. My entire electric light bill for lights, pumping water, ironing and washing is less than my former bill for grinding feed alone, and I can have any mixture of feed at any time."

"What I like best about the Viking Hammer Mill", says A. W. La Bo, Monroe County, Michigan, "is its convenience. I can grind any mixture of feed I want and have it fresh. This mill is large enough for any farm. It is 100% in every way and it's easily the most economical way to grind feed. I wouldn't be without one."

Unsolicited testimonials like the two above and pictures of home made installations like the one at the left are received in nearly every mail.

Grind your own feed at low cost, when you want it, as you want it. Powered with a one-half horse power motor the Viking Hammer Mill grinds up to 700 pounds of feed per hour with less than one kilowatt hour per hour.

Write for literature and complete information

VIKING MANUFACTURING CO.
Jackson, Michigan

IF YOU want all the comforts and convenience that RUNNING WATER can bring you, be sure to get the water system best adapted to your individual needs. Much depends on your source of water supply and the amount of water you require.

Choose a HOOSIER *For Lasting Satisfaction*

Your dealer can help you in determining whether you need a deep well or shallow well outfit, capacity, etc. He also knows the value of Flint & Walling's 70 year experience in building quality water supply products. Hoosier Electric Pumps and complete systems are built extra sturdy for long, hard service. Many special features. Galvazink inside and out ends rusty water. Oil and water cannot mix. Complete line of systems for every need.

Write for **FREE BOOK**

Ask your dealer. Or write for free book which tells you how to analyze your water problems and pick the system that's best for *you*.

FLINT & WALLING MFG. CO.
1135 Oak Street, Kendallville, Ind.
MAKERS OF THE STAR *ZEPHYR* WINDMILL

controlling the temperature of the comfort, and a transformer to change the house current of 110 volts to 23 volts. In various parts of the comforter there are six small thermostats. Ordinarily these would never be used, but they would cut off the current if the comfort ever got too hot.

The electric comfort is not a bulky covering. Here it is all ready to be plugged in.

The surprising thing about this comfort is that it can be laundered easily. The special waterproof insulation of the wires permits that. It is about the weight of a single blanket, but it gives all the warmth you need on the coldest night.

• • •

THE END OF THE MEAL

IF it's desserts you are hunting for, here are a couple worked out for you in the laboratories where women spend their days cooking on new electric stoves. I can think of worse jobs, can't you?

Amherst Pudding

3 cups bread flour
1½ teaspoon soda
½ teaspoon salt
1½ cups sour milk
1 cup molasses
1 cup ground suet
1 cup chopped raisins

Sift dry ingredients. Add other ingredients and mix well. Pour into greased cans, only half full. Place in well cooker with two cups water. High heat until steam flows from vent, then Low. Cook from 3 to 3½ hours.

Cream Puffs

½ cup butter
1 cup water
1 cup flour
3 eggs

Bring butter and water to boil at High heat. Add flour all at once, stir vigorously until ball forms in center of pan. Remove pan from unit. Add eggs one at a time, beating each one into the mixture. Shape on slightly greased cookie sheet with spoon or pastry bag and tube. Bake at 425° for 30 minutes, then at 300 degrees for last 20 minutes.

IN their declining years, American barbers' chairs are shipped to the Congo, where they are used as tribal thrones. —Advertising and Selling.

Savings on Sawing

George R. Harrison, Valparaiso, Indiana

A. D. Gilson of Hebron, Indiana, was remodeling his big barn. For a foundation and also to give better sanitation inside the dairy stable he decided to replace the lower part of the old wooden

Chester Gilson and his homemade power hand saw

structure with a concrete wall. Since the barn was sided with boards running up and down, that meant that all the boards must be cut off in a straight horizontal line some three or four feet from the ground.

It would have been a long hard job with hand saws, but Chester Gilson, son of the farm owner, contrived the easy way. Within a wooden frame that he made, he bolted a motor from a washing machine. Then on the motor shaft he fastened a ten inch circular saw. With this frame guided in an exactly straight line by sliding along a straight edge that had been nailed to the siding for that purpose, young Gilson did the sawing. It meant a run of almost 200 feet for him, but it was easy, he said, and done in about the time it takes to tell about it.

"We wouldn't be without our electrical equipment for anything in the world," said the father, as he watched his son sawing away the lumber to give place to something more durable.

Conscience

The story is told of a driver who, on his day off, went hunting. A terrible storm came up. He looked about for shelter but there was none. It began to rain in torrents, so he crawled into a hollow log. It fitted snugly. The rain lasted for hours, and the water soaked through the wood. The log swelled and the hollow grew smaller. When the storm was over, the hunter could not get out. He stretched and strained to no avail; he was held tight.

Like a drowning man, he saw his whole life flash before him, especially his mistakes. He realized what a traffic chiseler he had been—how he had speeded when he knew he might run down a child; how he had hogged the road; how he had woven in and out of traffic; how he had jumped the lights and disregarded stop signs, endangering the lives of all his fellow motorists.

And, believe it or not, when he saw himself in his true light for the first time, he felt so small he was able to crawl out of the log without difficulty.

For
FALL and WINTER

More and more, Century portable motors are finding a necessary place on the farm doing all kinds of year 'round chores.

In the fall and winter particularly—during the Grinding, Baling and Wood Sawing season—they are especially valuable. . . . At all times they do more work in less time and add comfort and leisure to enjoy the better things in life.

Built in 3 and 5 horse power sizes—for Single and 3 Phase current. . . . Write for information.

CENTURY ELECTRIC COMPANY
1806 Pine Street **St. Louis, Mo.**
Offices and Stock Points in Principal Cities

Century
MOTORS
UP TO 600 H. P

DIRECT FROM FACTORY TO YOU . . .

Modern Refrigeration at a far lower cost, is yours with the Uniflow Lectrik-Ice.

We want to send you a booklet which takes you right into our showroom and back through our factory where the Lectrik-Ice Uniflow is made. You can select a refrigerator that meets the needs of your size of family . . . and buy it direct from us, thus keeping the responsibility for its satisfactory operation right where it belongs . . . with us who make it.

Some good territories left for live-wire salesmen.

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RUNNING WATER
TRUE FAMILY SERVANT
WATER SOFTENERS

ELECTRIC REFRIGERATORS
UNIFLOW MFG. CO.
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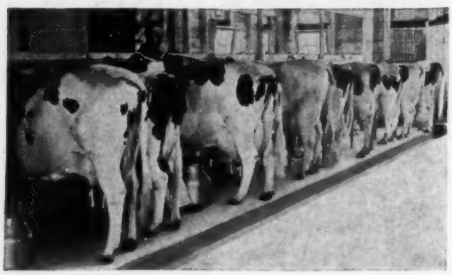
MILK COOLERS



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Wonderful Labor Savers and Money Makers

EVERY well equipped dairy should have a De Laval Separator and a De Laval Milker. There is nothing which will give greater profit and satisfaction.

De Laval Milkers are now used on thousands of farms to milk many of the world's best cows. They milk faster, better and cleaner.

For 60 years De Laval Separators have been the World's Standard. Twelve styles and sizes, for every need and purse.

See your De Laval Dealer or write nearest office below.

The De Laval Separator Co.

New York.....165 Broadway
Chicago.....427 Randolph St.
San Francisco.....61 Beale St.

ON THE AIR

Conducted by JEROME J. HENRY

Best Swingsters Trained in Opera

THE best swingsters are those who have been trained in the classical-operatic tradition, in the opinion of Ray Block, director of the Swing Fourteen. That's why he has been so fussy in choosing the personnel of his unusual chorus. Here's a who's who in this chorus:

William Hargreaves, baritone, sang bass with the American Opera Company; Fred Roberts sang tenor roles with the same company; George Kirk was a baritone winner in the National Federation Music Club Contest and carried principal roles in "New Moon" and 'Revenge With Music"; Floyd Sherman, besides winning a place in the 1930 Atwater Kent Contest, put in two years with the Opera Comique; Norman Horn, tenor, sang for two years with the Detroit Opera Company.

Among the women, Genevieve Rowe, soprano, was a winner in both the Atwater Kent Contest and the National Federation Music Club Contest; Marion McManus, another soprano, sang duets

Barbara Luddy and Les Tremayne, New Stars in the First Nighter Dramas.

with Nelson Eddy in the Hollywood Bowl; Francis Adair, who is a contralto with the "Fourteen" and a soprano on the stage, sang prima donna roles in the "Scandals," and in addition to her swing music, does solo work over NBC. Judy Freeland, Beverly Freeland, and Helen Jackson are old radio songbirds. Once billed as the "Blue Flames," they add extra heat to the group's hot tunes.

• • •

Author Turns Editor

FAYETTE Krum, hard-working author of the dramatic air serial, Girl Alone, is back in her home town holding down a job as copyreader on The Pontiac Daily Leader, in addition to writing her daily radio script.

No newcomer to newspaper ranks, having

worked on three Chicago papers, Miss Krum is gathering material for new episodes of Girl Alone, which partially deals with adventures of a wealthy heiress and a newspaper reporter.

"It's the first real visit I've had for a long, long time," Miss Krum, spending a month at Pontiac, Illinois, said. "I'm having such a good time working on the Leader and everyone is treating me so splendidly, I'll hate to leave.

"We're really glad to have Fayette back with us. She's a big help here around the office, writing heads and editing copy," says Editor Jerome Pearre.

• • •

Studio Chatter

Here's how some NBC notables of today got started in their youth: Bing Crosby, picking fruit in state of Washington orchards. . . . Lowell Thomas, selling newspapers in Cripple Creek, Col. . . . Kayne King, working for his keep in a Davenport (Ia) orphan's home. . . . Don Ross, digging ditches and serving as a roofer's helper. . . . Bob Hope, running errands for a butcher, selling shoes and stringing telephone wires.

Forty-five, and so youthful-appearing she looks more like a sister than the mother of two grown daughters, Irene Rich happily pursues her career as an NBC artist while proudly watching her children win fame in the arts. The elder, Frances, a Smith College graduate, is a sculptress, and designed the memorial to nurses to be erected in the Arlington Cemetery near the Tomb of the Unknown Soldier. The other daughter, Jane, is an actress, a member of the Summer stock company at Stockbridge, Mass.

Snapshots from NBC's family album: Jimmy Blair, baritone heard with Johnny Green's Orchestra, is a descendant of John Hancock, of Declaration of Independence fame. . . . The last name of Edgar Bergen, the voice of "Charlie McCarthy," is properly spelled Bergren. Born in Chicago, he is of Swedish parentage. . . . Paul Rhymer, author of the Vic and Sade sketches, is married to the former Mary Frances Murray, in 1931 voted the most popular girl at Illinois Wesleyan University.

Concerning the matrimonial status of some leading men in the Chicago NBC studios: Lester Tremayne, of The First Nighter, is a bachelor and lives alone in an apartment overlooking Lake Michigan. . . . Pat Murphy, the "Scoop" Curtis of the Girl Alone serial, is married to the former Lucille Edwards, formerly of the staff of KSTP, St. Paul, Minn. . . . Art Van Harvey, the Vic of Vic and Sade, is also happily married.

• • •

And Look Out for Splinters, Folks

WOODEN gifts received by the cast of Today's Children, on the occasion of the serial's fifth anniversary on the air, have at last been sorted and classified.

The gifts and their donors follow:

A croquet set from Bruce Kamman and the

(*Continued on page 32*)

CONVENIENCE

The benefits of a WESTCO Pump are many—a constant supply of running water for the stock . . . for the family . . . for the garden . . . for fire protection. WESTCO never fails you . . . never gets out of order . . . lasts a lifetime . . . only ONE moving part—the impeller . . . no metal-to-metal contact . . . patented removable liners protect pump casings . . . easy to replace . . . inexpensive . . . WESTCO pumps 38% more than its rated capacity to ground floor and basement faucets.

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Pumps and complete water systems for shallow or deep wells . . . or any other source of supply.

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Grind your feed with electricity for as low as ¼¢ per 100 pounds. Write for circular and prices of our Feed Grinders for automatic operation. They elevate grain and feed if desired.

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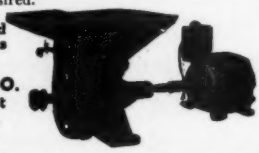

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Since 1858

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What of it!
TRUMBULL
Automatic Electric
POULTRY WATER WARMER
Prevents Freezing — Protects Profits

Frozen water, not cold weather, causes egg slumps. Get more eggs when prices are highest by keeping drinking water always at 50° F. A card will bring you valuable information. Address

The Trumbull Electric Mfg. Co., 1012 Woodford Ave. Plainville, Conn.

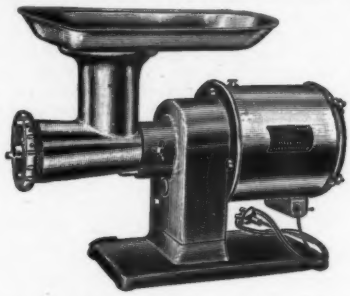
What's New

Reviewed by T. E. HIENTON

Names and addresses of manufacturers of the articles described in this column will gladly be furnished upon request.

Electric Meat and Food Chopper

The first fall freeze is the occasion for many small gatherings of two or three farm neighbors to butcher a hog or steer or perhaps both. As the carcasses are cut up for table use, certain

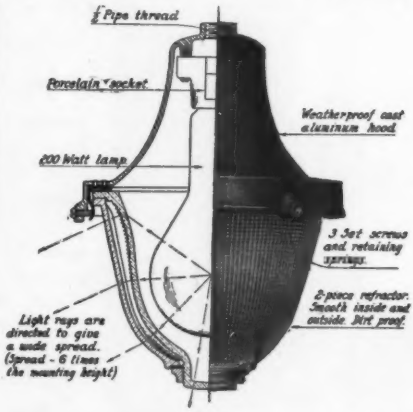


portions are ground into sausage or hamburger. This grinding process has been facilitated on many farms by attaching a motor to the grinder or purchase of a grinder with motor attached.

A new electric chopper of a size convenient for the farm or home has been recently announced by an eastern manufacturer. The entire unit which is 18½ inches long, 7 inches wide, and 11¾ inches high is mounted on an iron base. The chopper is driven by a ¼-horsepower, 110-volt, a.c. motor.

Wide-Spread Flood Light

During the shorter days of fall, winter, and early

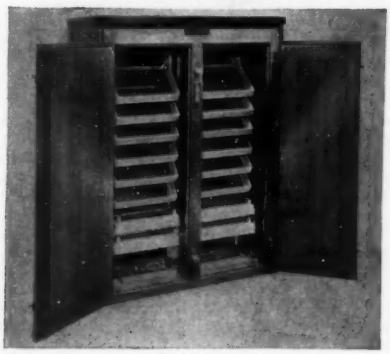

½ Pipe thread
Porcelain "socket
Weatherproof cast aluminum hood
200 Watt lamp
3 Set screws and retaining springs.
2-piece refractor. Smooth inside and outside. Dirt proof
Light rays are directed to give a wide spread. (Spread - 6 times the mounting height)

spring many farm chores are performed during the hours of darkness. When electricity is available

on the farm, the labor involved in doing the chores may be reduced with the installation of adequate lighting equipment in the yard and around the farm buildings.

A type of lighting unit which furnishes the wide light distribution desirable around farm yards has been developed by a manufacturer of illumination equipment. This unit produces a uniform low intensity illumination in a circle having a diameter of six times the height above the ground. The fixture part is of cast aluminum alloy and tapped for ½-inch pipe mounting. The unit is available in sizes for 200, 150, and 100-watt lamps.

Electric Incubator



One of the leading incubator manufacturers which concentrates on the production of relatively small machines for breeders, fanciers and game farms, has just announced a new Baby Grand model of only 1080 egg capacity.

This machine is reported to be the smallest of all redwood models on the market and is really a junior model of their larger 2000 and 3000 egg machines. It has standard dependable electrical instruments, all of which are mounted on a convenient removal panel. It is designed to set a case of hen eggs per week.

Many small breeders, fanciers and game farms will be much interested in operating their own incubators. Electrically operated machines have usually replaced those heated by other fuels where careful regulation of temperature and humidity was deemed necessary.

The Sum Total

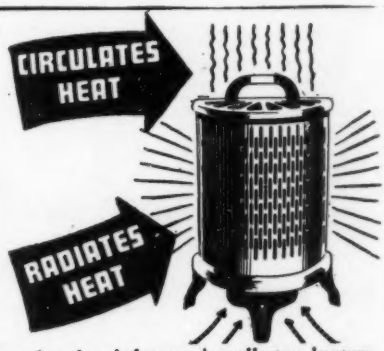
"Dad, what part of speech is woman?"
"Woman ain't part of a speech, son. She's all of it."

Passenger: "I don't sleep a wink, the way this train jerks. Is the engineer crazy?"
Porter: "No, boss, he's jest teachin' his wife how to drive!"

Sarcasm

The show girls were having a wordy conflict.
"And another thing," said Miss Clara. "I would thank you not to go around slamming my looks, when the fact is, my face is my fortune."
Miss Sonia sniffed haughtily.
"My dear girl," she said coldly, "I did not slam your looks. All I said was that if your face was your fortune, as you said it was, you ought to be arrested for passing counterfeit money."

Two Electric Heaters in One



NEW TYPE HEATER SAVES MONEY

Dress, shave, shower in cheery warmth with this new *double-action* electric heater. Actually two heaters in one, Wesix radiates cozy, penetrating heat out the front—at the same time circulates clean, healthful, warm air out of the top to surround you with luxurious comfort.

Because of this *double-action* principle, Wesix brings comfort far more quickly—and costs far less to use.

Ideal around children—no hazards—nothing to fill or spill—approved by Good Housekeeping Institute and Fire Underwriters' Laboratories.

Built of light-weight, rust-proof aluminum—has no moving parts—nothing to get out of order—unconditional *five-year guarantee.*

Use the Wesix anywhere—no special wiring required. Easily carried from room to room. Beautiful silvery finish trimmed in ebony black.

Buy a Wesix portable today from your electric light company or any dealer selling electrical appliances. If your dealer cannot supply you, send $9.95—regular purchase price—direct to the Wesix Electric Heater Co., 2424 Wesix Building, San Francisco, California.

WESIX *Electric* HEATER

Fastest . . . Finest! Electric **COW CLIPPER**

World Famous

STEWART CLIPMASTER

Exclusive Stewart design ball-bearing motor is air cooled and entirely encased in the insulated *EASY-GRIP* handle that is barely two inches in diameter. Completely insulated—no ground wire required. The fastest clipping, coolest running, easiest-to-use clipper for cows, horses, dogs, mules, etc. Stays sharp longer. A $25 value for $17.95 complete. Slightly higher west of Denver. 100-120 volts. Special voltages slightly higher. At your dealer's or send $1.00. Pay balance on arrival. Send for FREE catalog of Stewart electric and hand-power Clipping and Shearing machines. Made and guaranteed by Chicago Flexible Shaft Company, 5524 Roosevelt Road, Chicago, Illinois. *47 years making Quality products.*

Preferred the world over for its greater speed, ease of handling, rugged, lasting durability.

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Dept. P66 Freeport, Illinois

ONLY MAKOMB HAS IT—

The only heater that fits any fountain, that drops into trough of 5- 8- 10-gal. round founts. Holds water at 50° in any weather —automatically.
Finest construction—absolutely guaranteed. We replace free any proving defective within 12 months.
Price $3.00 Postpaid or see your Dealer. Also, famous Elect-O-Stat Brooders, Electric Incubators, Electric Batteries with Natureized Contact Heat.

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MACHINERY cuts the cost of farming. Advertising, which is the machinery of selling, likewise cuts the costs of things you buy. It costs more to farm or to sell without machinery. Advertising is a real service to the buyer.

On the Air

(*Continued from page 29*)

kids of Kaltenmeyer's Kindergarten; a wooden salad bowl from soprano Vivian Della Chiesa; an ax handle from Bob Burns on which he extended congratulations and scrawled "handle with care"; a hickory hammer handle from MacDonald Carey of Young Hickory, and a Chinese backscratcher and a wooden match holder from Fibber McGee and Molly.

Rudy Vallee sent a small wooden dog; George Burns and Gracie Allen, a rolling pin; Joan Blaine, a wooden tub; Orchestra Leader Harry Kogen, a meat pounder; Night Club Master-of-Ceremonies Morey Amsterdam, a pair of boat oars; Les Tremayne, a photo of a lumber camp, and Anne Seymour and Bob Griffin of The Story of Mary Marlin, a wooden duck containing a clock.

Vic and Sade sent a wooden plaque; Thor Ericson of Kaltenmeyer's Kindergarten, a pair of wooden door knobs; Sports Announcer Hal Totten, a baseball bat; Betty Winkler, two pieces of wooden dinner ware; Barbara Luddy, a wooden cigarette case; Mercedes McCambridge, a wooden serving tray, and Sports Announcer Clem MacCarthy, a brass-bound oaken bucket.

George Shelton, Tom Howard, and James Melton at the Sunday Night Party—and When Howard Sings It's Tough on the Customers.

Questions and Answers

Conducted by R. U. BLASINGAME

Motor for Deep Well Pumps

Question: *What size motor would be required to pump water from a well 160 feet deep with 80 feet of water in the well?*

Z. B. T.

Answer: Use a 1/3 h.p. motor for quantities up to about 250 gal. per hr., or ½ h.p. for quantities between 250 and 480 gal. per hr. The horsepower required depends upon the depth to water, the quantity of water pumped per hour and the losses in belting, gears and friction in the pump. When pumping is started, the water will "draw down" in the well, that is, it will not flow into the well fast enough to maintain its level. This "draw down" must be allowed for in the lift. The smaller deep well pumps ordinarily deliver about 250 gal. per hr. The power losses in this case were estimated at ¾ of the power delivered by the motor. If pumping into a pressure tank at 20 to 40 pounds pressure use the next larger size motor. Most water system catalogs contain tables of horsepower requirements under different conditions.

Deep Well Pumps

Question: *I wish to know how deep a well a centrifugal pump will work successfully. My well is 60 feet deep.*

S, W.

Answer: Centrifugal pumps will operate satisfactorily with a suction lift of from 4 to 15 feet, depending upon the type of impeller used. If the distance to the water in your well is but a few feet more than the suction lift of your pump, it may be possible to set a horizontal centrifugal pump in a pit and belt-connect it to a motor at the ground surface. For the satisfactory operation of this type of drive the depth of pit is ordinarily limited to about 15 feet.

Where a deep pit is required a vertical centrifugal pump may be used. This type is driven by a vertical shaft which may be of considerable length. When the construction of a pit is impractical, a deep well turbine pump may be used. These pumps are driven by a rotating vertical shaft and they may be placed at any depth in a drilled well of suitable bore.

One Pump for Two Wells

Question: *Is it possible for one small shallow well pump to pump water from two wells thirty feet apart? If so, how?*

L. C. R.

Answer: It is possible for one shallow well pump to pump water from two wells provided the total lift is not greater than 23 feet; that is, the sum of the vertical distance the water is lifted and the friction head in the suction pipe must not be greater than 23 feet. Tables giving the friction of various sizes of pipe with various quantities of water being pumped are available in pump catalogs. I would advise that you furnish either me or the manufacturer of your pump with a sketch of your proposed hook-up indicating the distance to

Farmer Says Viking Mill is the Machine for Me

John Padot, Monroe County, Mich. farmer has this to say about his Viking Hammer Mill:

"In November, 1936, I took one of these feed grinders on trial. At that time I was not sure it would do the work, but the roads here are sometimes so bad that the portable truck grinder could not always get to my farm, so I thought I would try it anyway. I ground feed for 10 cows, 5 young cattle and some hogs, and now I say if I had three times as much grinding to do it would still be the machine for me."

Write for literature and complete information.

Viking Manufacturing Co.
Jackson, Michigan

WARNER
Premier Electric Brooder
6 EXCLUSIVE ADVANTAGES
Raise more chicks and poults at lower cost in the Warner! Exclusive advantages include air-conditioning, no damp floors. Chromalox super-speed heating units, no fire worries. Ask your dealer.
THE NATIONAL IDEAL COMPANY
Premier Poultry Equipment
914 F Summit St., Toledo, Ohio

PARAGON SYSTEM MAKES HENS PAY
Hens pay, only when they produce eggs. To get more eggs in winter, give hens as long a workday as in summer. Light them earlier—keep them lighted longer. But **absolute regularity of lighting** is needed for best results.
PARAGON SYSTEM OF POULTRY HOUSE LIGHTING
guarantees a perfectly uniform light day by its full automatic control. Instantly set for any desired timing. Installed by anyone. Automatic dimming for roosting period. Dust-proof, damp-proof. Made by the largest exclusive time control factory.
Ask for free Bulletin 41.
Paragon Time Controls are adaptable to any type circuit.
PARAGON ELECTRIC CO.
37 W. Van Buren Street CHICAGO

9" x 3' SOUTH BEND LATHE
New Low Terms
ONLY $6.00 A MONTH
Ask for FREE Catalog
$90 LESS MOTOR DRIVE
WRITE for details on this new 9" x 3' Workshop Precision Lathe, back geared, screw cutting. Made in 8 different drives, 4 bed lengths, 33 practical attachments available for use with this lathe. Weight 320 lbs. crated.
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What? How? Why?

Have you read all the manufacturers' advertising in this magazine? It will tell you What, How and Why electrical equipment can help you.

A review of the leading applications for electricity listed below should help you to determine what appliances should best serve to improve operations on your farm.

If our advertisers cannot give you all data and information you require, just fill out and send us the handy coupon at the bottom of this page. This service is FREE.

For Home

___Better Sight Lamps
___Clocks
___Clothes Washers
___Coffee Makers
___Dishwashers
___Flat Irons
___Food Mixers
___Ironing Machines
___Lighting Fixtures
___Portable Heaters
___Radios
___Ranges
___Refrigerators
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___Sewing Machines
___Toasters
___Vacuum Cleaners
___Waffle Irons
___Water Heaters
___Water Softeners
___Water Supply

Gen'l Farm Equipment

___Auto Engine Heaters
___Corn Shellers
___Ensilage Cutters
___Feed Grinders
___Feed Mixers
___Floodlights
___Hay Choppers
___Hay Hoists
___Insect Killers
___Motors
___Threshing Machines
___Ultra Violet Light
___Ventilators
___Wood Saws

For Dairy Farm

___Animal Clippers
___Bottle Washers
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___Cream Separators
___Dairy Sterilizers
___Milk Coolers
___Milking Machines

For Poultry Farm

___Brooders
___Burglar Alarms
___Drink. Fount. Warmers
___Egg Cleaners
___Egg Graders
___Incubators
___House Lighting

For Truck & Fruit Farm

___Fruit Graders
___Fruit Polishers
___Fruit Washers
___Irrigation Equipment
___Light for Plant Growth
___Soil Heating
___Stationary Spray Plants
___Vegetable Washers

For Farm Shop

___Bench Saws
___Drills
___Paint Sprayers
___Soldering Irons
___Tool Grinders
___Welders
___Woodworkers

FREE INFORMATION COUPON

ELECTRICITY ON THE FARM
Readers' Service Dept., 24 W. 40th St., New York

Without cost to me, please have manufacturers send complete information on the following Electrically Operated Equipment which I am thinking of buying:

....
....
....

My name is.....
Address.....
I get electricity from.....
..... 11-37

Questions and Answers

(*Continued from page 33*)

the water in the well, the distance of the pump from the wells and the capacity of the pump in gallons per minute, together with the size of pipe you plan to use. With this information I can give you more help with this problem.

Television Progressing

AFTER eight years of continuous research and experiment in cooperation with the Engineering Staff of the Radio Corporation of America, the National Broadcasting Company is inaugurating outdoor pick-ups this fall for the first time in this country. The television pick-up equipment will be mounted on two large trucks manned by ten engineers. Receiving sets have been placed by NBC in 100 homes in the New York metropolitan area.

Bringing Up Father

"WHEN I was a boy of 14, my father was so ignorant I could hardly stand to have the old man around. But when I got to be 21, I was astonished at how much the old man had learned in seven years." MARK TWAIN.

THE colored preacher, after talking to his congregation about free salvation, asked Brother Smith to take up the collection. A parishioner got to his feet and protested: "Parson, I thought you said salvation was free—free as the water we drink."

"Salvation is free, Brother," replied the minister. "It's free and water is free, but when we pipes it to you, you have to pay for the piping."

—Wall Street Journal.

CLASSIFIED ADVERTISING

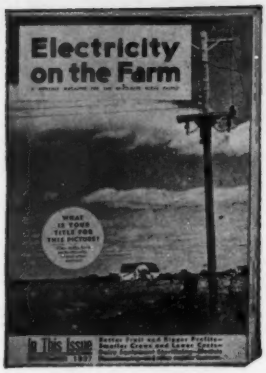
ELECTRIC SUPPLIES FOR POULTRYMEN. Manufactured by the oldest electrical manufacturer of electrical poultry equipment. Modern fan brooders, fly electrocutors, incubators, burglar and fire alarms, water heaters, time switches, thermostats, etc. The Lyon Line gives reliable performance at low cost. Write for FREE catalog. LYON ELECTRIC CO., Dept. EF, San Diego, Cal.

BIG MONEY in poultry this year. Read Poultry Tribune, the big monthly magazine that tells how leading poultry raisers make money. The only poultry magazine operating its own experimental farm. Five years $1.00, one year trial 25c. POULTRY TRIBUNE, Dept. C-53, Mount Morris, Ill.

Are you interested in a DIMMER TIME SWITCH for Poultry house lighting? If so, write today to the Automatic Electric Mfg. Co., Mankato, Minn., for full information on a complete line of Time Switches for your poultry house lighting.

HAVE YOU A SOUND, PRACTICAL INVENTION for sale, either patented or unpatented? New ideas can now be safely sold without patenting expense. We have been successfully helping others since 1924. Write for proof and tell us what you have for sale. CHARTERED INSTITUTE OF AMERICAN INVENTORS, Dept. 108, Washington, D. C.

FREE—Bargain Catalog of handy electrical tools, drills, motors, machinery and accessories for home owners, farmers and mechanics. Combination ¼" drill and portable grinder, $6.95; wood-turning lathe, $6.55; metal-cutting lathe, $15.50. PARAMOUNT PRODUCTS, 245F Broadway, New York City.



SEPTEMBER COVER

RULES
NOVEMBER CONTEST

Seven cash prizes will be awarded for the best titles to the picture on the front cover of this magazine.

The first prize will be $20 cash; the second prize $5.

In addition, five consolation prizes of $3 each will be awarded for the best title from each of these five geographic sections of the country: 1—New England, 2—Middle and South Atlantic States, 3—East Central (Ohio, Ind., Ill., Mich., Wis., Ky., Ala., Tenn., Miss.), 4—West Central (Minn., Ia., Mo., N. D., S. D., Neb., Kans., Ark., La., Okla., Tex.), 5—Mountain and Pacific (other far western states).

In case of a tie, each winning contestant will receive the full cash prize to which he or she is entitled.

Titles should be brief—the shorter the better.

All members of the farm family to whom this magazine was sent may submit titles, but each contestant may submit only one title.

Question "A" must be answered.

Entries must be sent to the Title Editor, ELECTRICITY ON THE FARM, 6 North Michigan Avenue, Chicago, Illinois, before December 1st.

Winning names and titles will be announced in the January issue.

Send your title on the coupon or make out a similar form on a plain sheet of paper or government postcard.

TITLE CONTEST

Awards for September Titles

FIRST PRIZE — $20.00 CASH

"Well Posted."

RICHARD H. ALLEN,
ROUTE 2, BOX 167, SAN DIEGO, CAL.

SECOND PRIZE — $5.00 CASH

"The guide post to farm conveniences and comfort."

FRANCIS L. BAIN,
SURRY, N. H.

Five Sectional Prizes — $3.00 Each

"The 'highway' to rural progress."
MRS. DELBERT HARRIS, R. D. 2, Middletown, Conn.

"A good line to hand the farmer."
MRS. LAFAY GEITNER, W. Main St. Rd., Attica, N. Y.

"The electric line on the farm today
"Is an outward sign of less work and more pay."
VIVIAN STALLWORTH, Canoe, Ala.

"The sign post of progress."
MRS. GEORGE STOKES, R. F. D. 3, Baton Rouge, La.

"The electric arm—from city to farm."
MRS. RUSSELL ROBESON, 755 W. 48th St., Murray, Utah

My title for the November Front Cover picture of ELECTRICITY ON THE FARM is.....

.....

(a) Please list names and addresses of the dealers you would go to when purchasing electrical household appliances .....

.....

.....

My Name Is.....R. F. D.....

Post Office.....County.....State..... 11-37

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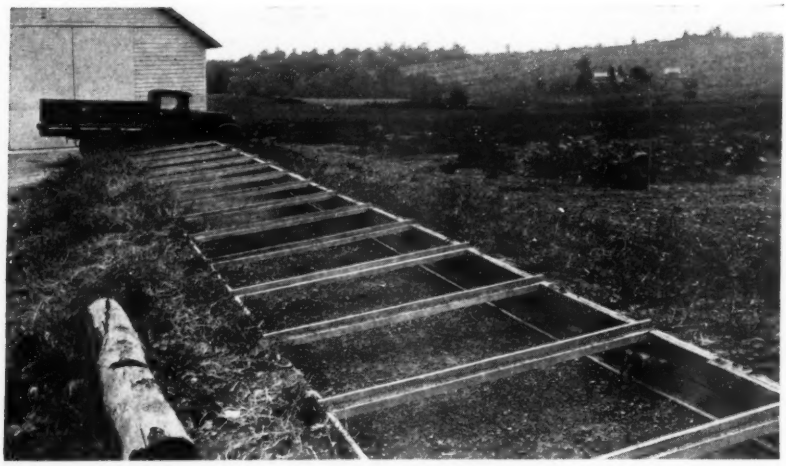

It's too soon to plant— but not too soon to plan!

Beat the normal market and command highest prices for your crops.

Electric soil heating helps you to do this by making earlier germination possible and by producing sturdier, faster growing plants. Heat is ready at the turn of a switch and controlled by a thermostat.

It isn't expensive! Only two pieces of equipment are required and they are quickly and easily installed. Once in, the equipment lasts for years.

ASK YOUR POWER COMPANY

or your electric soil heating cable dealer for complete instructions for building an electric hotbed in your spare hours.

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